EXHIBIT 105

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Forecasting Product Liability Claims

Epidemiology and Modeling in the Manville Asbestos Case

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they assumed that $b = 4.37 \times 10^{-8}$ (−80.1%) would be appropriate for the average worker exposed to Johns-Manville asbestos. Model 4 was the best-fitting model; its estimates of b and k were used in all further calculations in this chapter. The larger standard errors in Model 4 (and 1) were due to the extremely large sampling correlation of −0.995 between b and k. When k was fixed (as in Models 2, 3, and 5), the b estimate was quite precise.

Model 5 was the latency form preferred by Peto et al. (1982). Although the fit to the Selikoff and Seidman (1991) data was poor, as was the fit of Peto et al.'s (1982) no-latency form (Model 0), the fit of each model to their own data was excellent (i.e., $\chi^2 \leq 4.06$; 5 d.f.).

The parameters in Table 8.7 were modified to reflect the relative intensity and absolute duration of exposures in the eight occupation groups defined in step 2. To do this, we relied extensively on estimates produced by Selikoff (1981) (see Sections 3.3.1-3.3.2). The results are in Table 8.8.

The estimates of relative risks of mesothelioma in Table 8.8 were taken directly from Selikoff (1981, Table 2-16) for occupation groups 1-5. The estimates of average duration of exposure for occupation groups 1-5 were taken from Selikoff (1981, Table 2-13), using the average of the two values reported for 1950-1959 and 1960-1969.

Occupation group 6 required special treatment because it was an aggregate of five groups in the R2 occupation classification (see step 2), and these did not completely match Selikoff's groups (see footnotes 3 and 4 in Table 8.8). The weighted average relative risk was 10% and the average duration was rounded to 7 years because the occupational match was only approximate. As noted in footnote 5 in Table 8.8, the implied intensity of exposure at 10% relative risk is approximately equal to the 1976 OSHA standard for permissible exposure: 2 f/ml (OSHA, 1983, p. 51,087).

Occupation groups 7 and 8 had no correspondence in Selikoff's (1981) classification. It was necessary to make some assumptions to proceed with the model specification.

We were guided by two considerations. First, the average cumulative exposure in occupation groups 1-5 should have been higher than in groups 6-8, because the former were the main groups with significant occupational exposure (Selikoff, 1981) (see Section 3.3.1). Our classification reinforced this difference by including the self-reported occupation codes (A, F, I, S, and R; see step 2) with the first five R1-industry groups to form the R2 (and R3) classifications. Second, to the extent that the cumulative exposure in occupation groups 6-8 was substantially lower, the sensitivity to additional proportional changes in relative risk was minimal (see Section 7.5). The remaining sensitivity reflected changes in the depletion of the pool of surviving exposed workers as the initial pool was altered.

We approximated the relative risk for occupation groups 7 and 8 as 10% of the risk of insulation workers. This level roughly approximated the 1976 OSHA standard for ambient asbestos concentrations (Table 8.8, footnote 5). The average duration of exposure for occupation group 7 (Military) was assumed

Table 8.8: Estimates of Relative Risk and Average Duration of Employment in Asbestos-Exposed Workers

R3 Occupation	Relative Risk of Mesothelioma		Average Duration of Occupational Exposure	
	From Selikoff (1981)	From Stallard and Manton (1994)	From Selikoff (1981)	From Stallard and Manton (1994)
1. A: Primary Manufacturing	1.00	1.00	3.65	3.65
2. F: Secondary Manufacturing	0.50	0.50	3.75	3.75
3. I: Insulation Work	1.00	1.00	14.15	14.15
4. S: Shipbuilding and Repair	0.50	0.50	4.75	4.75
5. R: Construction Trades	0.15-0.25[1]	0.20	7.90	7.90
6. Util/Trans/Chem/Longshore	0.10[2]	0.10	6.76[2]	7.00[6]
R2-6: Railroad Engine Repair	0.20	—	7.70	—
R2-7: Utility Services	0.18[3]	—	6.00	—
R2-8: Chemical/Petrochemical	0.15	—	8.05	—
R2-9: Maritime/Longshore	0.10[4]	—	7.60	—
R2-11: Automobile Maintenance/Repair	0.04	—	6.85	—
7. Military	—	0.10[5]	—	4.00[7]
8. Other/Unknown	—	0.10[5]	—	7.00[8]

Notes –

1. Higher risk refers to years 1958-1972 when the use of sprayed asbestos-fireproofing was common.
2. Weighted average of R2 Industry/Occupation groups 6-9 and 11.
3. Estimate is weighted average of values for (1) stationary engineers and firemen and (2) utility services – see Table 3.1 of Chapter 3.
4. Selikoff's estimate refers to Marine Engine Room Personnel (except U.S. Navy); our estimate refers almost totally to Longshoremen – see Table 8.1.
5. Estimate is based on ratio of the 1976 OSHA standard of 2 f/ml to our estimate of 20 f/ml for unit relative risk – the rough average of 20-40 f/ml in primary manufacturing and 15 f/ml in insulation work (Selikoff, 1981, Table 2-14).
6. Rounded up from 6.76 years.
7. Approximation based on 4-year enlistment.
8. Approximation based on R3 Industry/Occupation group 6.

Source: Adapted from Selikoff (1981, Tables 2-13 and 2-16).

to be 4 years; and for group 8, it was 7 years. These assumptions implied average cumulative exposures of 8-14 f-yr/ml.

The relative risk estimates in Table 8.8 were used to rescale the parameter b in the OSHA model to the appropriate levels for each occupation. The duration estimates were used in place of the parameter d in the OSHA model.